



RESEARCH SUPPORT

Preparation of the *Continuation Plan 1996-2001* entailed a review of current aquaculture literature and discussions with many aquaculturists to determine research needs and constraints to aquaculture development. In addition to limited knowledge of various aspects of production systems, lack of access to training and to information were found to restrict aquaculture development. In response to these needs, the program created research support as a separate building block of its proposed research activities. Research support activities build capacity through education, technology transfer, information management, and networking.

Central Database, Education Development, and Information Management and Networking are the three branches of the CRSPs research support activities. Annual activity reports for these three projects make up this chapter.

CENTRAL DATABASE MANAGEMENT

MOU No. RD009G

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Networking Activities

Database Manager Doug Ernst served as president of the American Fisheries Society Bioengineering Section. He was also in contact with the Consortium for International Earth Science Information Network (CIESIN) regarding Internet GIS-based access to data in the PD/A CRSP Central Database. During the reporting period, Ernst continued collaborative work with the International Center for Living Aquatic Resources Management (ICLARM) and the Network of Aquaculture Centers in Asia Pacific (NACA).

Publication

Ernst, D.H., J.P. Bolte, D. Lowes, and S. Nath, 1998. PD/A CRSP Central Database: A standardized information resource for pond aquaculture. In: K. Fitzsimmons (Editor), *Tilapia Aquaculture: Proceedings from the Fourth International Symposium on Tilapia in Aquaculture*. NRAES, Ithaca, New York, pp. 683-700.

Conferences

Fourth International Symposium on Tilapia in Aquaculture at Orlando, Florida, 9-12 November 1997. (Ernst)

PD/A CRSP Annual Meeting at Las Vegas, Nevada, 12-14 February 1998. (Ernst)

Aquaculture '98, WAS Annual Meeting at Las Vegas, Nevada, 15-19 February 1998. (Ernst)

Annual Governing Board Meeting of the American Fisheries Society, March 1998. (Ernst)

REPORT: PD/A CRSP CENTRAL DATABASE MANAGEMENT AND DEVELOPMENT

Eighth Work Plan, Database Management 1 (DM1)

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BACKGROUND

The PD/A CRSP Aquaculture Central Database is a centralized data storage and public query-retrieval system for CRSP-sponsored research in aquaculture food-fish production (Hopkins et al., 1987; Batterson et al., 1991; Bolte et al., 1997; Ernst et al., 1997). The Database is open for data submission from all PD/A CRSP-funded aquaculture research projects, as well as other aquaculture research efforts with compatible objectives and compliance with standardized methodology (Egna, 1996; Ernst and Bolte, 1997). For data use, the Database is available cost-free and is of interest to researchers, educators, outreach and extension agents, and producers in pond-based aquaculture.

Datasets may be searched and extracted from the Database based on fish culture location, calendar year, fish species, and desired data types. A comprehensive interface to the data and related information in the Database is provided at its designated Internet website (<http://biosys.bre.orst.edu/crspDB>). This publication mechanism provides immediate and comprehensive access to the Database worldwide. Since its inception in January 1997, the Database website has received 1,400 visitors. While it is not known how these visitors utilized the site, this level of use compares well to the 30 documented cases of Database use from 1983 (inception) through 1996. For intensive users of the Database, the entire Database is also available on electronic media (100 MB Zip disk).

The Database currently contains over 80 aquaculture production studies and represents the world's largest inventory of standardized aquaculture data. The majority of studies currently in the Database are for production of Nile tilapia (*Oreochromis niloticus*) in subtropical and tropical solar algae ponds receiving inputs of plant materials, inorganic/organic fertilizers, and/or prepared feeds. Studies of other pond fishes and penaeid shrimp under monoculture and polyculture management are also available. Countries with research and research support projects that have contributed to the Database include Egypt, Honduras, Indonesia, Kenya, Panama, Peru, Philippines, Rwanda, Thailand, and USA.

Two fundamental rationales for developing the Database were to:

- 1) Create a mechanism for analysis of variance among geographically dispersed aquaculture research sites, in addition to analyses within single ponds and among ponds at a single location; and
- 2) Support development of predictive models for aquaculture pond processes (Egna et al., 1987).

Prein et al. (1993) also present a strong argument for the development of standardized aquaculture databases. They show that when individual, standardized studies are combined into a single dataset, a continuum of data is created that spans the fish culture methods used and fish production levels achieved. This provides an opportunity for application of statistical, multivariate analyses and elucidation of multiple factor, synergistic relationships that would otherwise be not possible or possible only with additional research.

In addition, regional-scale and facility-scale computer tools are increasingly being used to locate, plan, design, and manage aquaculture facilities (Ernst and Nath, 1997). These computer tools require standardized datasets for their development and calibration and often utilize predictive models developed through aquaculture research. Finally, the Database may be applied directly to practical problems in aquaculture design and management. For this purpose, the Database provides comprehensive results of rigorous applied studies that may be used as sources of benchmark and comparative fish production data for specific fish culture sites, methods, and species.

OBJECTIVES

Objectives of the work completed under the Eighth Work Plan were to advance the management of the Database by carrying forward work in progress and opening new areas of development. These objectives fall into two major areas consisting of:

- 1) *Research data acquisition* for the Database from CRSP principal investigators and
- 2) *Research support and outreach* functions provided by the Database for the CRSP.

Regarding data acquisition, objectives include improved capacity, efficiency, standards, and incentives for data submission to the Database. Regarding research support and outreach, objectives include improved access, reporting, and usefulness of the Database to researchers and the greater aquaculture community.

These objectives are represented by a number of specific tasks, and the remainder of this discussion is organized according to

these tasks. For each task, background information and accomplishments are given as well as directions of continued work to provide continuity between work plans. References to *menu items* in this discussion refer to menu items on the home page of the Database website where additional documentation of the given subject area can be found. The reporting period of this report is 1 August 1997 to 31 July 1998.

TASKS AND ACCOMPLISHMENTS

Data Submission

Tasks

Track status of datasets due to the Database from CRSP studies and add submitted data to the Database when forthcoming.

Background

As of 31 July 1998, the Database contained data from 82 studies performed under the First through Eighth CRSP Work Plans (Table 1; menu item Experiment List). This represents approximately two-thirds, by rough estimation, of the total studies performed under the CRSP for this period. For studies prior to the Eighth Work Plan, data submission from CRSP principal investigators to the Database was not contractually enforced. For the Eighth and later Work Plans, data submission from CRSP principal investigators to the Database will be contractually enforced. Based on these differing policies, follow-up procedures on past-due data submissions from these two management periods require different mechanisms. A critical requirement common to all data submission tracking is the availability of summary tables that provide listings of studies performed in each work plan. Data for each study should include: 1) study title and identification number; 2) study theme; 3) site name; 4) start and end dates of study period; 5) data types collected; 6) responsible principal investigators; and 7) data and report submission status.

Completed

For the Eighth Work Plan, a summary table was developed in collaboration with the PMO, where data formats, housing, and interfaces are provided at the Database website and table content is the responsibility of the PMO (except data-submission status). This table facilitates project tracking by providing a single, current source of concurrently available information. Methods used in the Database and its web interface to support this table can be easily duplicated; thus tables and interfaces for future work plans can be implemented with little additional work. Write capabilities (data entry and editing) for these tables are restricted to the PMO and Database Manager. Read capabilities (data review) are not restricted and provide summary information for project management as well as a listing of current research areas for website users (menu item Projects).

For Work Plans prior to the Eighth (i.e., in the period ending 31 July 1996), the CRSP Technical Progress Subcommittee (TPSC) was assigned the responsibility of developing Work Plan summary tables (1997 PD/A CRSP Annual Meeting). This table was meant to provide a basis for both the Database Manager and the TPSC to contact responsible parties regarding the status of past-due data submissions and intended submission timelines. Given that the submission of this data relies on the goodwill of the responsible parties, incentives to researchers for data submission have been addressed in completed or ongoing work. These include author citations for datasets extracted by data users, linkage to related author

Table 1. Total aquaculture experiments reported in the PD/A CRSP Central Database as of 31 July 1998, by site and work plan.

Site Name	Work Plan								Total	
	1	2	3	4	5	6	7	Interim		8
Choluteca, Honduras								1		1
Comayagua, Honduras	1	2	2	2	4	1				12
Aguadulce, Panama	2	2	2							6
Gualaca, Panama	2		2							4
UNAP, Peru										0
Abbassa, Egypt							1			1
Sagana, Kenya										0
Rwasave, Rwanda	2		2	4	3					11
Bogor, Indonesia	2	1	2							5
FAC, Philippines						3	3			6
Iloilo, Philippines	2	2	2							6
AIT, Thailand				3	3	3	3			12
Ayutthaya, Thailand	1	2	2	3	4	4	1			17
Huay Luang, Thailand										0
Nong Sua, Thailand	1									1
TOTAL	13	9	14	12	14	11	8	1	0	82

Data submitted ¹	Data owed ²	No experiments conducted

¹ Numbers in white cells indicate number of studies submitted and do not necessarily include all studies conducted. Total number of studies with data owed is under study by Technical Progress Subcommittee.

² "Data owed" status is under study by Technical Progress Subcommittee.

publications, statistical and reporting procedures for datasets, and expanded visibility and potential for use of study data as made possible by its publication on the World Wide Web. The position espoused by the Database Manager is that publication of data in the Database should be viewed as an opportunity for additional research outreach, impact, and recognition.

Continued

As of August 1998, the Database Manager has not received any materials from the TPSC regarding the generation of summary tables for the First through Interim Work Plans. When this information is forthcoming, the Database Manager and the TPSC will be able to take a more active role in pursuing past-due datasets from CRSP-sponsored research.

Training Workshops

Tasks

Provide training for CRSP principal investigators on procedures for submitting data to the Database and use of the Database for research purposes.

Background

Database training budgets for personnel travel and lodging are outside the scope of the Database Manager. However, budgetary and organizational support may be provided by the Education Development Component of the CRSP. This practical training promotes efficient data management practices by researchers, from the format of record spreadsheets used at research sites to the submission of data to the Database. This training also serves to familiarize participants with research applications available to them at the Database website and the benefits of Database publication of their work.

Completed

In August 1997, a one-day training workshop on the Database and use of the World Wide Web was organized by Marion

McNamara of the CRSP Education Development Component. Participants included Eneida Ramírez (Honduras), Antonio Circa (Philippines), Fernando Alcántara-Bocanegra (Peru), and Bethuel Omolo (Kenya). Participant feedback showed that the training was beneficial to their research efforts and their collaboration with the CRSP Database. A similar training scheduled for the Thailand CRSP site in the Fall of 1998 has been canceled due to lack of funding.

Continued

Future Database training workshops depend on the availability of external funding.

Supported Data Types

Tasks

Complete additional data tables and associated data submission protocols for data types generated by CRSP studies that are not currently supported by the Database.

Background

Consideration of new data types for the Database is an ongoing process performed in response to the development of new research areas and based on discussions with CRSP principal investigators. Conditions for addition of new data types to the Database are that the data represent a sufficient level of subject and content development and that the data have thematic relevance to the greater aquaculture community. Potential data types that were considered in the current reporting period included: 1) fish reproduction; 2) socio-economic; and 3) economic data types.

Completed

For fish reproduction, discussions with Martin Fitzpatrick (OSU) showed that this subject area was not yet sufficiently developed for inclusion in the Database but likely would be within a few years. For socioeconomic data, a standardized questionnaire was provided by Joe Molnar (AU) for impact

assessment regarding adoption of specific aquaculture technologies. For economic data, Database capabilities for partial budget analyses were developed in cooperation with Carole Engle (UAPB). Partial budget analyses support comparative economic analyses of experimental treatments in comparison to a base production scenario (control treatment) and may include on-farm production trials as well as research experiments. Data type and formatting requirements for submission of socioeconomic and economic data have been added to the Data Submission Manual (Ernst and Bolte, 1997; menu item Data Submission). Data types currently supported by the Database now include the following: 1) weather; 2) pond soil analyses; 3) pond applications; 4) water quantity variables and management; 5) water quality variables and natural productivity; 6) fish productivity; 7) socioeconomic; and 8) economic.

Continued

Opportunities for adding new data structures to the Database will continue to be assessed, based on subject development and thematic relevance.

Handbook of Analytical Methods

Tasks

Add the PD/A CRSP Handbook of Analytical Methods (Piedrahita et al., 1991) to the Database, establish one-to-one linkages between Handbook variable names and Database data-field names, and provide a review interface for the Handbook at the Database website for use by research personnel and data users.

Background

Considering that standard research methods provide the basis for the existence of the Database, and that the Database provides a permanent storage medium for the PD/A CRSP, incorporation of the Handbook into the Database helps support both research personnel and data users. Standardized methods are an essential requirement of the Database, where replicate data from multiple temporally and spatially distributed aquaculture studies are combined under a common data organization and access structure. In addition, at the PD/A CRSP 1997 Annual Meeting, the Materials and Methods Subcommittee delegated responsibilities for Handbook revisions and additions. The Database Manager was charged with receiving and collating these updated methods, using the existing version of the Handbook as a starting point.

Completed

An electronic form of the Handbook was added to the Database, data field names for each variable covered in the Handbook were established under individual methods, and the Handbook was provided with a review interface (menu item Research Methods). The original, printed Handbook contains copyrighted materials, which are made available to CRSP researchers only. For public domain publication of the Handbook at the Database website, copyrighted sections are replaced with references. This public domain version is useful to data users as contextual information for specific studies (materials and methods) and to aquaculture research projects outside of the CRSP that are required to submit data developed under standardized methodology.

Continued

As inputs from the Materials and Methods Subcommittee come forward, methods in the Handbook will be updated.

Experiment-Treatment Specifications

Tasks

Add experiment-treatment specifications to the Database that define the materials and methods used for each treatment dataset regarding fish production methods. Include fish production methods in Database search criteria.

Background

Database search criteria of fish production site, dates, fish species, and desired data types may be used to refine and limit data searches to a large degree. However, additional search criteria of fish production methods would be useful to Database users. These production methods are defined by experiment-treatment specifications and include the following:

- 1) Fish (or shrimp) stocking densities and existence of polyculture;
- 2) Initial fish sizes;
- 3) Frequencies and rates of applied fertilizers and feeds; and
- 4) Additional treatment specifications such as water exchange and aeration.

This approach requires that each set of treatment data in the Database, comprised of three or four sets of replicate data, is supported with complete treatment specifications. Unfortunately, treatment specifications for data submitted to the Database prior to January 1997 were not required. Experiment protocols and treatment specifications are now required at the time of data submission.

Completed

To generate experiment-treatment specifications for data submitted to the Database prior to January 1997, CRSP literature was initially consulted. However, CRSP Work Plans, Technical Reports, and Annual Reports were of limited use for defining treatment specifications in the Database, especially after the Third Work Plan, given their superset relationship to the subset of data in the Database, the apparent re-mixing of experiment treatments between proposals and reports, and lack of linking references in the reports and Database. Next, procedures were used to compile fish stocking, pond application, and water management data in the Database and summarize these data as replicate mean values. Results from this analysis were unable to provide complete treatment specifications and raised a number of questions. First, given that this procedure was performed for each experimental replicate (pond), it was not always clear how to group these replicates into treatments given the variability between replicates. Secondly, significant numbers of replicates showed no fish stocking (17%) and/or material applications (27%). With no corroborative information, it was not known if these replicates had missing data. Also, for derived replicate groupings, there was no mechanism to check the accuracy of derived treatment specifications.

Continued

Summary tables for the First through Interim Work Plans, to be developed by the TPSC (see Data Submission and Status Tracking), would be very helpful to the completion of this task. These summary tables would provide a basis for tracking datasets back to work plan and report literature where experiment objectives, protocols, and treatment specifications can be found. These summary tables would also help identify responsible principal investigators and determine the completeness of submitted datasets. If the TPSC provides no materials to the Database Manager by the 1999 PD/A CRSP

Annual Meeting, then treatment specifications derived from reported study data will be used. By either mechanism, treatment specifications will be reviewed by associated principal investigators where possible.

Contextual Linkage

Tasks

Provide context-sensitive linkage to supporting information for user-extracted datasets, including research site and facility descriptions, research author citation and contact information, and related publications.

Background

The value of extracted datasets to Database users is considerably enhanced by provision of related information, analogous to those provided in traditional printed publications of research studies. This information includes the following:

- 1) Principal investigator information to support data citations and referrals;
- 2) Site and facility descriptions to support fuller accounting of materials and methods; and
- 3) Associated publications that provide research objectives, experimental protocols, and discussions of results.

The Program Management Office already maintains much of this information as individual web documents, and thus the major remaining task was to develop procedures to dynamically link this information to user-extracted datasets based on dataset characteristics. Two major characteristics of datasets and related information that support this linkage procedure are study location(s) and time period(s).

Completed

Manual linkage to research site, author, and publication information is available at the Database website via hyperlinks to web documents maintained by the Program Management Office (PMO). Linkage to publications required the development of publication data tables and interfaces, used to locate and access specific publications (abstract or full text) maintained as individual web documents. Publication data tables consist of publication titles, authors, abstracts, keywords, and descriptions. These data may be searched based on keywords, subjects, and authors. Write capabilities (data entry and editing) for these publication tables are restricted to the PMO and Database Manager. Read capabilities (data review) are not restricted (menu item Publications). Content of the publications data table is the responsibility of the PMO, and there are currently 220 publications in the publications table.

Continued

Automated linkage to research site, author, and publication information will be developed when possible. This will consist of dynamically created sets of hyperlinks, presented to the Database user based on extracted datasets. Linkage to author information is currently hindered by the lack of summary tables for the First through Interim Work Plans (see Data Submission and Status Tracking). These tables would provide author-date-site linkage for past and current principal investigators of the CRSP.

Technical Support

Tasks

Provide a data dictionary, technical glossary, and users manual for Database users, available at the Database website.

Background

Definitions of data types (description and units) and technical terms used at the Database website, in conjunction with material contained in the Database Submission Manual and Handbook of Analytical Methods, are necessary for users to fully utilize the Database. A users manual is also necessary for users at all knowledge levels, given the relatively new type of information resource represented by the Database website. This manual should provide examples of typical Database search strategies and describe applications of extracted information to aquaculture design and management.

Completed

The data dictionary and technical glossary have been completed (see menu item Glossary).

Continued

The users manual will be completed following completion of statistical support procedures (see Reporting of Extracted Datasets).

Dataset Reporting

Tasks

Enhance the ability of Database users to utilize extracted datasets by providing graphical data presentation in addition to tabular summaries. A closely related task, beyond the scope of the current reporting period, is to provide statistical summaries of datasets to users.

Background

All tasks discussed in this report lead to better user support, but data reporting methods and applications are primary considerations. Availability of raw, replicate, sample data is of most use to people working in aquaculture research and model development. Users such as extension agents and producers are best supported by statistically distilled and graphical presentations of these data and design and management tools calibrated with these data.

Completed

Extracted datasets are currently available at the Database website as raw, replicate-level sampling data in tabular and graphical formats (e.g., water temperature and fish weight time-series data). Tabular data may be viewed at the Database website or downloaded to local computers, as comma-delimited ASCII files readable by spreadsheet programs. Graphical data presentation is also available at the Database website. This consists of combined XY line graphs for all replicates in the extracted dataset based on the selected variable as a function of time or water depth. Graph lines are color-coded and labeled by replicate (pond) name. Mechanisms to support graphical web presentation utilize a server application (Allaire Cold Fusion) to support client-server database access and database publication via the Internet. This application is used in conjunction with the database software (Microsoft Access). A programming language (Java, Sun Microsystems) is used to embed plots in web pages for graphical data retrieval.

Continued

Statistical summary procedures for extracted datasets are under development. Summary statistics will include time-series data for treatment means and variances (standard errors), analysis of variance, and fitted model parameters

(e.g., fish growth models). These statistics can be applied to graphical dataset presentation, for example, graphing of treatment means with standard error bars to show replicate variability. Summary data will also include variables calculated by combining data, for example, fish growth and feeding rates, feed conversion efficiency, and biomass density and productivity. Generation of summary calculations and statistics is also critical to the sharing of data from the CRSP Database to other information resources applicable to aquaculture (see Database Promotion).

Database Promotion

Tasks

Actively promote the Database to the greater aquaculture community through aquaculture conferences and publications, linkages to related websites and databases, and direct marketing to target audiences.

Background

The considerable effort that has gone into the development and publication of the CRSP Database must be supported through its promotion to researchers, educators, outreach and extension agents, and producers in pond-based aquaculture. Critical issues are user awareness of the Database availability, content, and applications. In addition, sharing of Database data with other aquaculture-related databases provides additional opportunity for users to be exposed to CRSP studies.

Completed

For the period of this report, the Database was presented at the Fourth International Symposium on Tilapia in Aquaculture (ISTA IV) (Ernst et al., 1997) and included in a session on aquaculture computer tools held at the 1998 Annual World Aquaculture Society Conference. Related databases and/or access sites currently in collaboration with the Database Manager for access to or containment of data in the CRSP Database include the ICLARM FishBase (Froese and Pauly, 1996), NACA (Bangkok, Thailand), and CIESIN. Simple site-to-site linkages with related aquaculture websites have also been established.

Continued

For data linkage with ICLARM, NACA, and CIESIN, data content and format requirements have been established, but transfer of or access to data in the Database will follow completion of statistical summary procedures (see Reporting of Extracted Datasets). These statistical summary procedures will be performed on the entire Database, and associated publication resources will be provided with summary treatment data rather than raw replicate data. Similarly, direct marketing of the Database beyond the research community (education, extension, and production) will follow completion of statistical summary capabilities and addition of data query constraints based on fish culture methods. Data submission from outside the PD/A CRSP has shown no success, but the potential for this type of collaboration will likely increase as the analysis capacity available at the Database website is further developed and made known.

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EDUCATION DEVELOPMENT

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Conference

PD/A CRSP Annual Meeting at Las Vegas, Nevada, 12-14 February 1998. (McNamara)

REPORT: ANNUAL ACTIVITIES OF THE EDUCATION DEVELOPMENT COMPONENT*Eighth Work Plan, Human Capacity Development 1 (HCD1)*

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BACKGROUND

The Education Development Component (EDC) was established in response to the need to improve human capacity development, one of the constraints to aquaculture to be addressed by the CRSP during this grant. The goal of the EDC is to complement the research activities of all CRSP projects by strengthening human capacity in participating countries and regions. The EDC's second year of operation is reported on during this period.

The EDC works with CRSP projects to design and implement appropriate training and education activities that support the research at each site. In addition to supporting site-specific activities, the EDC maintains a centralized clearinghouse for training and education opportunities in the fields of aquaculture, aquaculture development, aquatic ecology, fisheries, and natural resource management.

GLOBAL ACTIVITIES**Training Program for PD/A CRSP Research Associates**

The EDC sponsored a three-week training program from 20 October to 8 November 1997 for Host Country Research Associates from Kenya, Honduras, Peru, and the Philippines. The training was designed to orient new collaborators to the CRSP and included sessions on gender considerations, experimental design, use of computer resources, and CRSP water quality and fish sampling techniques. Workshop participants began their program at Oregon State University, where they were welcomed by CRSP Board member Kelvin Koong, OSU's Dean of International Programs Jack Van de Water, CRSP Director Hillary Egna, and Deputy Director Brigitte Goetze. CRSP researchers Jim Bowman, Wilfrido Contreras, Martin Fitzpatrick, John Bolte, and Doug Ernst taught seminars, as did Ingvar Elle of the Information Management and Networking Component. Training participants continued on to Auburn University where they were welcomed by Bryan Duncan, chair of the CRSP Board of Directors, toured catfish aquaculture facilities, and attended workshops presented by CRSP researchers Tom Popma and David Teichert-Coddington on water quality and fish sampling

techniques. The participants completed their program in Florida, where they attended the Fourth International Symposium on Tilapia in Aquaculture. At all three sites, participants attended seminars, lectures, and workshops, and gained first-hand knowledge of how university research and extension create partnerships with other governmental agencies and with the private sector.

Educational Opportunities Network (EdOp Net)

In addition to supporting activities that address specific needs in CRSP host countries, the EDC works to facilitate communication about educational opportunities worldwide in aquaculture and related fields. During this reporting period, the EDC continued publishing EdOp Net, a free monthly newsletter that summarizes educational and employment opportunities available in the fields of aquaculture, aquatic ecology, fisheries, fisheries biology, and natural resource management. EdOp Net is disseminated through the mail and through the Internet by email and the World Wide Web. Readership includes over 200 subscribers and over 1,600 hits on the web site each month. Toward the end of this reporting period, the Information Management Component assumed the responsibility for this publication.

International Conferences

The PD/A CRSP, through the EDC, was one of the sponsors of ISTA IV, the Fourth International Symposium on Tilapia in Aquaculture, held 9-12 November 1997 in Orlando, Florida. The EDC served as the CRSP link to the ISTA IV Planning Committee, providing assistance in organizing and publicizing the meeting.

Training Records

The EDC maintains records of formal and informal training efforts conducted by CRSP researchers, and makes this information available to CRSP researchers when requested. CRSP researchers have long recognized that education and training help to address the constraints to sustainable aquaculture development, and take advantage of opportunities to conduct formal and informal training activities. They conduct short courses and workshops, teach courses at host country institutions, and advise and mentor graduate students.

Even without formal financial support in the past, CRSP researchers have made significant contributions in the area of education and training.

Since the inception of the PD/A CRSP, over 500 individuals have participated in some form of CRSP education and training activities. Figure 1 shows the distribution of degree and non-degree training among those officially registered as CRSP participants. This figure does not include students of CRSP researchers who teach post-secondary courses in aquaculture at their home institutions. Figure 2 shows the gender distribution of CRSP training participants since the inception of the program.

Most participants in CRSP education and training activities are from current or past CRSP host countries—Egypt, Honduras, Indonesia, Panama, the Philippines, Rwanda, Thailand, and the US; however, the benefits of CRSP training activities extend well beyond the borders of these countries. Participants have been drawn from 33 countries over the course of the program, representing every region of the world (Figure 3).

Even without dedicated education and training funds, CRSP researchers have found ways to support students who are pursuing higher education degrees in aquaculture and related

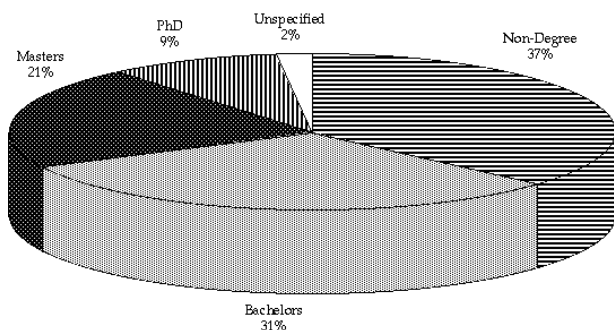


Figure 1. Distribution of PD/A CRSP degree and non-degree training, 1984-1998.

fields. Support has included providing graduate research assistantships for Ph.D. students, hiring undergraduate work-study students, providing research materials, and advising students working on research projects. During this reporting period, 10 formal degree programs were completed. Since 1990, over 50 theses have been completed, including 8 senior theses, 36 Masters theses, and 7 Ph.D. dissertations. The

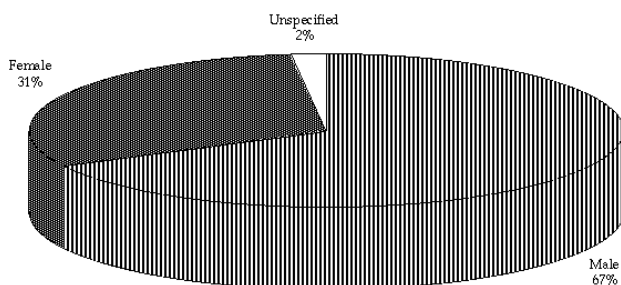


Figure 2. Gender distribution of PD/A CRSP training participants, 1984-1998.

following theses were completed this year with assistance from CRSP researchers:

- Chan, R. 1997. Interactive effect of feeding frequency and time of feeding for tilapia. M.Sc. thesis, Asian Institute of Technology, Bangkok, Thailand.
- De Jesus, M.J. 1998. An analysis of the commercial fishery of the Peruvian Amazon. M.S. thesis, Southern Illinois University, Carbondale, Illinois.
- Jatuporn, B. 1997. Effect of aeration on water quality and fish production in fertilized ponds. M.Sc. thesis, Asian Institute of Technology, Bangkok, Thailand.
- Massaut, L. 1998. Planktonic trophic interactions in catfish and sportfish ponds in the presence of an omnivorous filter-feeding fish. Ph.D. dissertation, Auburn University, Auburn, Alabama.
- Rachada, M. 1997. Turbidity in fish ponds in northeast Thailand. M.Sc. thesis, Asian Institute of Technology, Bangkok, Thailand.
- Rai, S. 1997. Co-culture of walking catfish with Indian major carps. M.Sc. thesis, Asian Institute of Technology, Bangkok, Thailand.
- Raghunath, B. Shivappa. 1997. Efficacy of probiotics and disinfectant in controlling luminescent bacteria in shrimp postlarvae under normal and stressed conditions. M.Sc. thesis, Asian Institute of Technology, Bangkok, Thailand.
- Rwangano, F. 1998. Effects of water temperature regimes on the productive capacity of ponds for tilapia production. Ph.D. dissertation, Oregon State University, Corvallis, Oregon.
- Yi, Y. 1997. An integrated rotation culture system for fattening large Nile tilapia (*Oreochromis niloticus*) in cages and nursing small Nile tilapia in open ponds. Ph.D. dissertation, Asian Institute of Technology, Bangkok, Thailand.

HONDURAS

The five-year plan for the EDC training program calls for concentration on one CRSP host country during each year. Organizational work done in Honduras during 1997 resulted in the formation of an advisory panel and the development of a scope of work for training activities in Honduras. During this reporting period, the following activities have been implemented:

Scholarship for Masters-Level Graduate Student

The first priority of the Education Advisory Panel was to improve the long-term capacity of Hondurans to initiate and manage aquaculture research projects. To this end, a significant portion of the Honduras training funds are dedicated to the support of an appropriate candidate in a Masters program at Auburn University. Over 40 application packets have been sent to Honduran students, and placement in the program at Auburn is anticipated for March 1999.

Short-Term Training Activities

A second priority identified by the Education Advisory Panel was the need to provide short courses for producers on technical and managerial topics. The EDC, in cooperation with members of the Honduras Advisory Panel and Principal Investigators Bartholomew Green and Carole Engle, presented two workshops in October 1997. Thirty-two participants registered for the workshops, which focused on business planning for aquaculture operations

and which were modified to address the needs of tilapia farmers in the San Pedro Sula area and the concerns of shrimp farmers in the Choluteca area. As suggested by the Advisory Panel members, private producers paid fees to cover the costs of the two-day workshops, and the EDC supported the attendance of participants from government and educational institutions.

Support for Regional Conference

The EDC is the focal point for the PD/A CRSPs co-sponsorship of the Fifth Central American Symposium on Aquaculture to be held in San Pedro Sula, Honduras, from 3 to 5 March 1999. The EDC worked with the organizing committee to create the Call for Papers and various announcements about the program. The EDC is in charge of producing the proceedings for the symposium, although the final printing will be done in Honduras.

Members of the Honduras Education Advisory Committee are:
 Francisco Avalos, Executive Director, Asociación Nacional de Acuicultores de Honduras (ANDAH)
 Marco Polo Micheletti Bain, Vice-Minister, Secretaría de Agricultura y Ganadería
 Medardo Galindo, Gerente General of the Federación de Agroexportadores de Honduras (FPX)
 Rosa García, Director, Dirección General de Pesca y Acuicultura (DIGEPESCA)
 Daniel Meyer, Head, Animal Sciences Department of Escuela Agrícola Panamericana (EAP)
 Marco Tulio Sarmiento, Chief, Aquaculture Department, DIGEPESCA
 Luis Morales, Chief, Research Department, DIGEPESCA
 Bartholomew Green, Co-Principal Investigator, PD/A CRSP Honduras project
 Alberto Zelaya, Gerente General, ANDAH

PHILIPPINES

During this period, an Education Advisory Panel was organized in the Philippines, with representatives from the institutions most involved in aquaculture development in the region, including representatives of the College of Fisheries and the Freshwater Aquaculture Center (FAC) at Central Luzon State University (CLSU), the Bureau of Fisheries and Aquatic Resources (BFAR) station at CLSU, the GIFT (Genetically Improved Farmed Tilapia) Foundation, and the US and Host Country principal investigators.

Planning for activities to take place under the Ninth Work Plan was the focus of this meeting. Funding cuts will curtail some of the efforts planned for the future under the Ninth Work Plan.

Increased Capacity for Training Activities

The EDC will collaborate with the FAC in seeking grants to increase the capacity of the center to serve as a training facility, and with BFAR to help develop a system to evaluate the effectiveness of training provided to producers who purchase fingerlings at the station.

Support for Graduate Level Thesis

The Advisory Panel recommended that small stipends to support graduate students would be the most productive way to encourage continued research related to the goals of the PD/A CRSP.

Members of the Philippines Education Advisory Committee are:
 Terry Abella, Dean of the College of Fisheries
 Tony Circa, Host Country Principal Investigator
 Kevin Fitzsimmons, US Principal Investigator
 Ruben Reyes, Manager of BFAR station
 Ruben Sevilleja, Director of the Freshwater Aquaculture Center

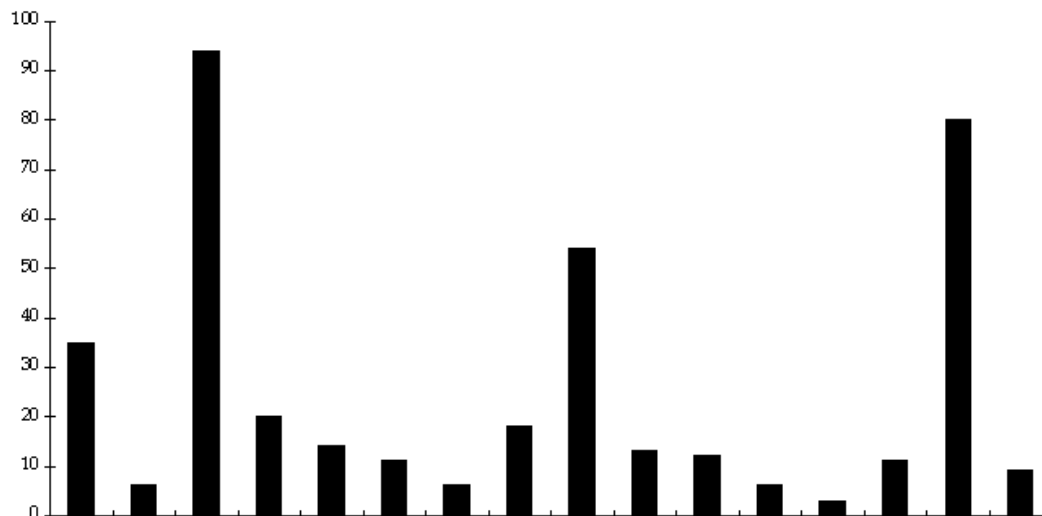


Figure 3. Home countries of PD/A CRSP training participants, 1984-1998.

INFORMATION MANAGEMENT AND NETWORKING

MOU No. RD009D

Staff*

Oregon State University, Corvallis, Oregon

Brigitte Goetze	Information Manager, Principal Investigator (Germany)
Danielle Clair	Assistant Information Manager
Ingvar Elle	Systems Administrator and Webmaster
Deborah Burke	Graduate Research Assistant
Matt Niles	Graduate Research Assistant (from November 1997)
Kris McElwee	Graduate Research Assistant (from December 1997)
Sayea Jenabzadeh	Office Support/Research Assistant
Danielle Crop	Editorial Assistant (from January 1998)

* All IMNC staff are employed at less than full-time.

Conferences

Scholarly Publishing in the Electronic Era at Toronto, Canada, September 1997. (Clair)

PD/A CRSP Annual Meeting at Las Vegas, Nevada, 12-14 February 1998. (Burke, Clair, Goetze, Jenabzadeh)

Second International Conference of Women in Agriculture at Washington, DC, 28 June-2 July 1998. (Goetze)

REPORT: ANNUAL ACTIVITIES OF INFORMATION MANAGEMENT AND NETWORKING COMPONENT

Danielle Clair, Ingvar Elle, and Brigitte Goetze
Office of International Research and Development
Oregon State University
Corvallis, Oregon, USA

The Information Management and Networking Component (IMNC), the research support component that works most closely with the Program Management Office (PMO), performs critical organizational roles related to information. IMNC is charged not only with the dissemination of technical and programmatic information, but also with the collection and analysis of impact information. This component also facilitates electronic and face-to-face networking. In the reporting period IMNC activities have focused on publication production and distribution, Internet activities, impact monitoring, and program promotion and networking.

The mission of IMNC is:

To increase awareness and visibility of the PD/A CRSP by publishing and providing accessible technical and programmatic information, to monitor and report CRSP impact, and to foster networking among persons involved in aquaculture.

Objectives are to:

- Identify target audiences for publications;
- Disseminate technical and programmatic information generated by the CRSP by providing appropriate materials and avenues;
- Track outputs of CRSP investigations;
- Promote networking of CRSP participants with aquaculturists around the world.

During the reporting year, IMNC staff conducted a thorough overhaul of the program's mailing list database, which now numbers over 925 entries from 60 countries.

In addition to maintaining a detailed inventory of PD/A CRSP publications, IMNC staff also began tracking publication circulation and distribution during this reporting period in an effort to better gauge what areas of research attract the highest amount of public interest. Since this tracking system is new, no significant trends are yet apparent.

WORLD WIDE WEB

IMNC is responsible for the development and maintenance of the PD/A CRSP website, which was brought online in 1995. In a test initiated by INTSORMIL, a sister CRSP, and conducted by an independent online website analysis service, the PD/A CRSP home page received the highest technical ratings for any CRSP home page.

Web-related activities in the reporting period include: translation of PD/A CRSP publications into web-available formats; periodic update of website sections geared toward improving document accessibility; improvement of website presence on the Internet; and regular tracking of website hits to gauge user preference and help to formulate website policies.

Translating CRSP Publications

The publications page of the PD/A CRSP Website <<http://www.orst.edu/Dept/crsp/pubs/publications.html>> is a valuable source of CRSP programmatic and research material. Publications available include the quarterly program newsletter *Aquanews*, Annual Administrative and Technical Reports, the PD/A CRSP Research Report Series, and Global Experiment literature. The IMNC placed the following publications on the website during the reporting period:

- *Fourteenth Annual Technical Report (Acrobat)* (HTML)
- *Fourteenth Annual Administrative Report (Acrobat)* (HTML)
- *Fifteenth Annual Technical Report (Acrobat)*
- *Fifteenth Annual Administrative Report (Acrobat)*
- *Eighth Work Plan (HTML)*
- CRSP Research Reports 97-103 to 98-123 (HTML)
- *Aquanews Newsletter*—All issues published in the reporting period (Acrobat)
- *Educational Opportunities Network Newsletter*—All issues published in the reporting period (HTML)
- PD/A CRSP Publications in Context

Improving Document Accessibility

In order to make web content more accessible, IMNC performed several site section updates, including: further development of the publications database; improvement of the publications page to accommodate the increased number of publications now offered; steps to enhance browsing between documents and provide more rapid document downloading; better browser compatibility; and facilitation of hard copy publication orders. IMNC also developed and placed on the site literature to help put into context the large number of CRSP publications.

The online publications database is a cooperative project between IMNC and CRSP Central Database staff. References to publications are added to the database via a password-protected, online form. The database now contains over 220 references to documents. A matching query on the database delivers the publication abstract and links to the full article. References have been set to all documents and abstracts in the Research Report Series and technical and administrative reports.

The overall layout of the publications page was improved to more clearly represent the array of articles and data available from the site. Changes include a more readable layout, more thorough document descriptions, and links to Central Database data.

Because the site is regularly accessed by international as well as domestic visitors, rapid document loading is critical. To help reduce document download times, the abstracts of CRSP Research Reports have been divided into smaller sections. Also, technical figures, when appearing with HTML-formatted publications, have been placed separately from the articles they relate to, so that users have the option of downloading the figures via a hypertext link if they wish to view them. Furthermore, all tables which appear with HTML-formatted articles, whenever possible, are placed in HTML format, which makes them load significantly faster than if they appeared as images.

Because so many publications are offered from the website, the webmaster developed a "Publications in Context" page (http://www.orst.edu/Dept/crsp/pubs/pubs_in_context.html) to

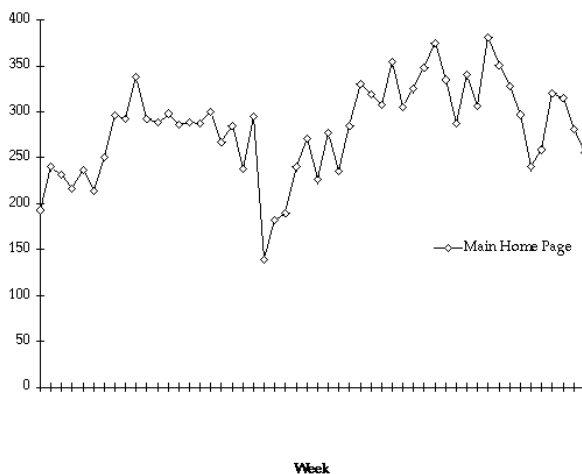


Figure 1. Weekly hits to the main page of the PD/A CRSP website (<http://www.orst.edu/Dept/crsp/homepage.html>).

explain the publication cycle and how the publications relate to each other and to the Central Database.

An unfortunate fact of the Internet is that web browsers will display content differently depending on the brand and version of browser and the operating system on which content is being displayed. Therefore, before documents are loaded onto the website, they are tested on versions of Netscape and Microsoft browsers and viewed on Windows and Macintosh operating systems.

While the primary purpose of the CRSP website's publication section is to make documents available for direct downloading, visitors often wish to obtain publications in hard copy format. Updates to the hard copy order page included the addition of links from each publication list to the order form, and the addition of a short Javascript to help ensure that users successfully filled out the order form. The page was subjected to testing by members of the Program Management Office.

Improving Internet Presence

In order for the website content to benefit the largest number of people, it should be easily located using website search engines. Toward this end, special care is now taken in developing document titles and metatag descriptions that will insure accurate indexing of individual articles as well as main sections on website search engines. In this way it is hoped that users may find specific articles directly from search engines without first having to go through the main home page.

In addition to search engines, many will arrive at the website from other websites. The webmaster has submitted the URL of the website to the major aquaculture sites on the Internet. A recent web search has indicated that the CRSP website is linked from 68 other websites.

Tracking Site Usage

The IMNC monitors hits to the CRSP website (Figures 1 through 4). This allows us to gauge the relative popularity of various sections and generate website policy. In capturing statistics, hits to the building in which the Program Management Office is located are not counted. Statistics indicate that the most popular section on our site is the education and job opportunities section (Figure 2). The publications page also enjoys a high degree of popularity (Figure 3). However, statistics showed that users were not utilizing the annual reports to a great degree. Therefore it was decided that the reports would no longer be translated into HTML format but would instead be put online in Acrobat format.

CRSP PUBLICATIONS

The CRSP has produced a variety of documents during the reporting period. After publication, each document is made available on the World Wide Web. In addition, the IMNC collaborates with the Central Database on maintaining a web page which contains information on the most recent work plan changes. Once a year the IMNC publishes an addendum to the current work plan which details the work plan changes that were necessitated by the vagaries of research during the past year.

From time to time, the CRSP publishes collections of reports. Two such collections were produced in the past year: *Lessons Learned from On-Farm Trials* contains five case studies of

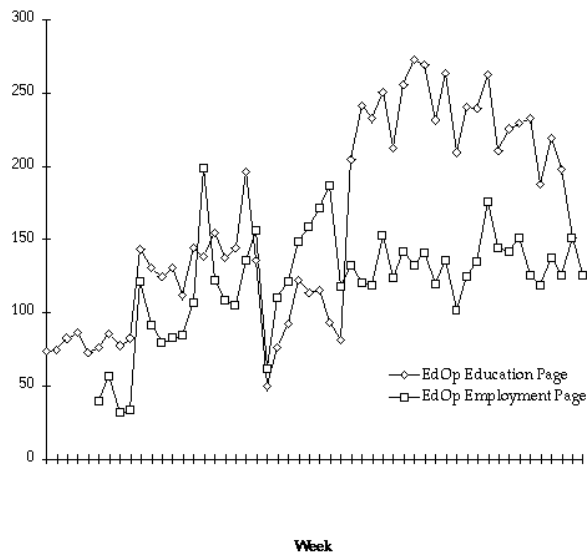


Figure 2. Weekly hits to the PD/A CRSP EdOp main pages. The EdOp pages contain monthly updated announcements of educational and employment opportunities in aquaculture and related fields.

PD/A CRSP farm trials in Honduras, Thailand, the Philippines, and Rwanda; *The Collected Abstracts in English, French, and Spanish* increases the accessibility of the CRSP Research Report Series by compiling the abstracts of 88 CRSP-sponsored research reports, together with their translations for non-English speaking audiences.

The CRSP commissioned Dr. Christopher Knud-Hansen (a former long-time CRSP researcher from Michigan State University) to write a pond fertilization guide entitled *Pond Fertilization: Ecological Approach and Practical Application*. The booklet was written primarily for educated farmers, extension workers, and aquaculture students and scientists. The over-

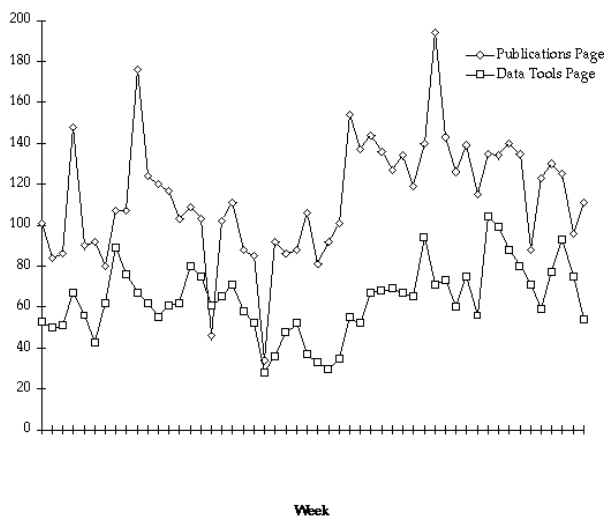


Figure 3. Weekly hits to the Publications and Data Tools pages of the PD/A CRSP website. The Publications page contains descriptions of and links to most major PD/A CRSP publications. The Data Tools page contains brief descriptions of and links to the PD/A CRSP Central Database and POND[®] decision support software.

riding objective of the guide is to help fish farmers worldwide optimize their resources for efficient fertilization—obtaining higher yields at reduced costs. The manuscript was significantly revised following review by four reviewers internal and external to the CRSP, and is scheduled for publication in late 1998.

A 10-year bibliography of CRSP researcher publications appears in Appendix 6 of this report.

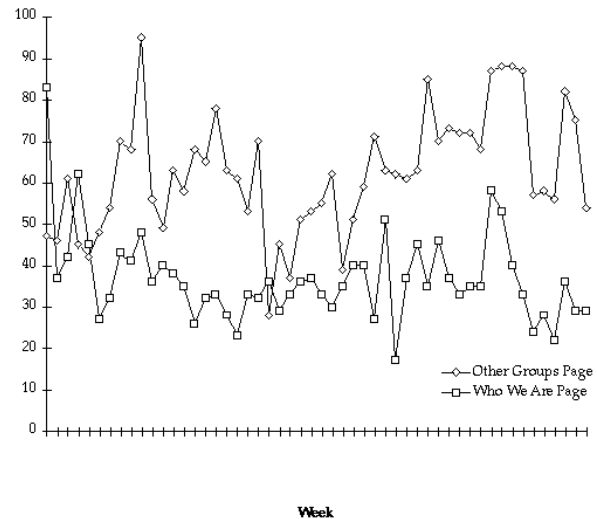


Figure 4. Weekly hits to the Who We Are and Other Groups pages of the PD/A CRSP web site. The Who We Are section contains links to PD/A CRSP introductory material, contact information, and study site descriptions. The Other Groups page contains links to websites related to aquaculture and international development.

During the reporting period, IMNC produced and distributed the publications noted below.

Fifteenth Annual Administrative Report
Clair, D., B. Goetze, D. Burke, J. Baker, and H. Egna (Editors), 1997. PD/A CRSP. Office of International Research and Development, Oregon State University, Corvallis, Oregon, 114 pp.

Fifteenth Annual Technical Report
Burke, D., J. Baker, B. Goetze, D. Clair, and H. Egna (Editors), 1997. PD/A CRSP. Office of International Research and Development, Oregon State University, Corvallis, Oregon, 188 pp.

Addendum to the Eighth Work Plan
Printed Spring 1998, 32 pp.

Lessons Learned from On-Farm Trials: The PD/A CRSP Experience
Printed Fall 1997, 84 pp.

The Collected Abstracts from the PD/A CRSP Research Report Series in English, French, and Spanish, 1987-1995. Printed Summer 1998, 188 pp.

CRSP Participant Directory, published December 1997 and July 1998.

CRSP List of Publications and Order Form, published December 1997 and July 1998.

CRSP Research Reports

This is an in-house publication series which includes Notices of Publication. The following Research Reports were issued in the last year:

- 97-111 Solubility of selected inorganic fertilizers in brackish water. (1/98)
- 97-112 Water quality in laboratory soil-water microcosms with soils from different areas of Thailand. (1/98)
- 97-113 Determination of phosphorus saturation level in relation to clay content in formulated pond muds. (1/98)
- 97-115 Influence of Nile tilapia (*Oreochromis niloticus*) stocking density in cages on their growth and yield in cages and in ponds containing the cages. (1/98)
- 97-116 Chemical and physical characteristics of bottom soil profiles in ponds on haplaquents in an arid climate at Abbassa, Egypt. (1/98)
- 97-117 Water effluent and quality, with special emphasis on finfish and shrimp aquaculture. (1/98)
- 97-118 A collaborative project to monitor the water quality of estuaries in the shrimp producing regions of Honduras. (1/98)
- 98-119 PD/A CRSP Central Database: A standardized information resource for pond aquaculture. (4/98)
- 98-120 Secchi disk visibility and chlorophyll *a* relationship in aquaculture ponds. (4/98)
- 98-121 Masculinization of Nile tilapia (*Oreochromis niloticus*) by single immersion in 17 α -methylidihydro-testosterone and trenbolone acetate. (4/98)
- 98-122 A strategic assessment of the potential for freshwater fish farming in Latin America. (4/98)
- 98-123 Experimental and commercial culture of tilapia in Honduras. (4/98)
- 98-124 Small-scale fish farming in Rwanda: Economic characteristics. (7/98)
- 98-124a Small-scale fish farming in Rwanda: Data report. (7/98)

IMPACT MONITORING

The CRSP uses impact indicators to monitor the effects of its research on stakeholders, beneficiaries, extension services, the research community, and the field of aquaculture. The method of using indicators to monitor impact was still new when the CRSP collated its Eighth Work Plan and consequently continued to experience rapid change and development. In order to benefit from the newest insights, the IMNC commissioned an impact indicator review by Dr. Candace Buzzard (now at USAID/Botswana) who has several years of expertise in the field. Dr. Buzzard explained the concept of impact measurement during a presentation at the Sixteenth Annual Meeting. She assisted each principal investigator individually by reviewing the current impact indicators for his/her research. Her findings are summarized in a report entitled *A Review of Impact Assessment and Performance Indicators for the PD/A CRSP* (May 1998) which also contained several recommendations and which was distributed to program participants.

In addition to these formal impact indicators, IMNC staff collect project specific impact information via quarterly impact reports which are designed to capture researcher activities related to items such as:

- Institution building (contacts with host country scientists, government officials, extension, agents, farmer organizations, farmers, non-governmental organizations)
- New host country involvement
- Physical support for host country institutions (i.e., pond renovation)
- Linkage development (with USAID missions, regional institutions, etc.)
- Conferences attended
- Seminars, presentations, and or workshops given
- Electronic linkages
- Publications
- Theses
- Informational material developed

These forms are requested on a quarterly basis and allow the IMNC to monitor and track progress in the areas of outreach, public service, and professional development. The assembled information is shared with the Board of Directors and External Evaluation Panel to assist them in their periodic assessments of program and project progress.

PROGRAM PROMOTION AND NETWORKING

In an effort to increase the visibility of the program, the IMNC was represented at a PD/A CRSP display booth at the Fourth International Symposium on Tilapia in Aquaculture in Orlando, Florida, in November 1997. Over 50 visitors to the booth requested to be added to the CRSP mailing list. In addition to requesting the newest CRSP research results, visitors were also highly interested in the CRSPs Education Development Component and its services.

The IMNC also hosted information booths and poster displays at three local events at Oregon State University: University Days, Earth Week, and DaVinci Days. The DaVinci Days Festival in Corvallis, Oregon, is a widely publicized and well-attended event that draws visitors from across Oregon.

Informal networks are also established via CRSP Mail. The CRSP email address posted on the website elicits frequent questions from the public; questions are either answered by IMNC staff or routed to CRSP researchers with specific expertise in the query area. CRSP researchers have connected via this medium with producers in the CRSP host countries who were previously not aware of the CRSPs existence. During the reporting period, IMNC staff responded to requests for information from researchers, NGOs, and students in eleven countries (US, Spain, Suriname, India, Canada, Guyana, Ivory Coast, Philippines, Lebanon, Israel, and Pakistan). The following is a sample of the queries received via CRSP Mail: technologies used by aquaculture industry and other related industries for the removal of suspended solids and phosphorus from effluent discharge, appropriate species for brackishwater shrimp culture, and aquaculture projects in the Amazon.

